Causes, Control, and Prevention of Accidental Poisonings

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A SURVEY by the American Academy of Pediatrics in the early 1950's revealed that accidental poisonings were among the most frequent accidents encountered by pediatricians in private practice. Drugs and kerosene were often the toxic agents. Following this survey, the academy established a subcommittee on accidental poisoning to aid in development of a network of poison control centers. The first such center was established in Chicago in September 1953 under the aegis of the Illinois chapter of the academy. Hospital-based, the center was primarily concerned with treatment of childhood poisoning.

At the request of organized medicine in New York City, including the New York Academy of Medicine and local county medical societies, a New York City Poison Control Center was established on March 9, 1955, as an integral part of the New York City Department of Health (*1*). It has a full-time professional staff of 12, including public health sanitarians, a full-time technical director (an organic chemist with long experience in poison control), and a medical director (the author). In addition, the center uses the services of several bureaus of the New York City Department of Health, such as the bureau of laboratories, bureau of preventable diseases, environmental sanitation, bureau of public health nursing, bureau of public health education, bureau of records and statistics, and other agencies. It has the full cooperation of the chief medical examiner's office of New York City and of the city's department of hospitals.

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Poisonings 1955–63, New York City

In 1964 more than 20,000 poisonings were reported to the New York City Poison Control Center. From March 9, 1955, date of the center's establishment, to the end of 1963, more than 95,000 poisonings were reported. A poison is defined here as any substance capable of causing injury or producing untoward symptoms or toxic manifestations when ingested, absorbed, inhaled, topically applied, or injected. The rise in the annual number of incidents reported to the center is shown in these figures:

Year	*Incidents*
1955	2,910
1956	4,800
1957	6,988
1958	8,499
1959	9,250
1960	10,174
1961	15,630
1962	18,350
1963	19,485
Total	96,086

The increase in the number of poisonings during 1955–63 perhaps reflects better reporting rather than an absolute increase. The reported events, however, do not represent true incidence since the majority of poisonings are unreported.

Physicians only notify the center of cases in their private practice on which they need advice and guidance. Children under 4 years were involved in more than 50 percent of the total poisonings reported for all ages in 1955–63 and 84 percent of poisonings reported in persons under 20 years.

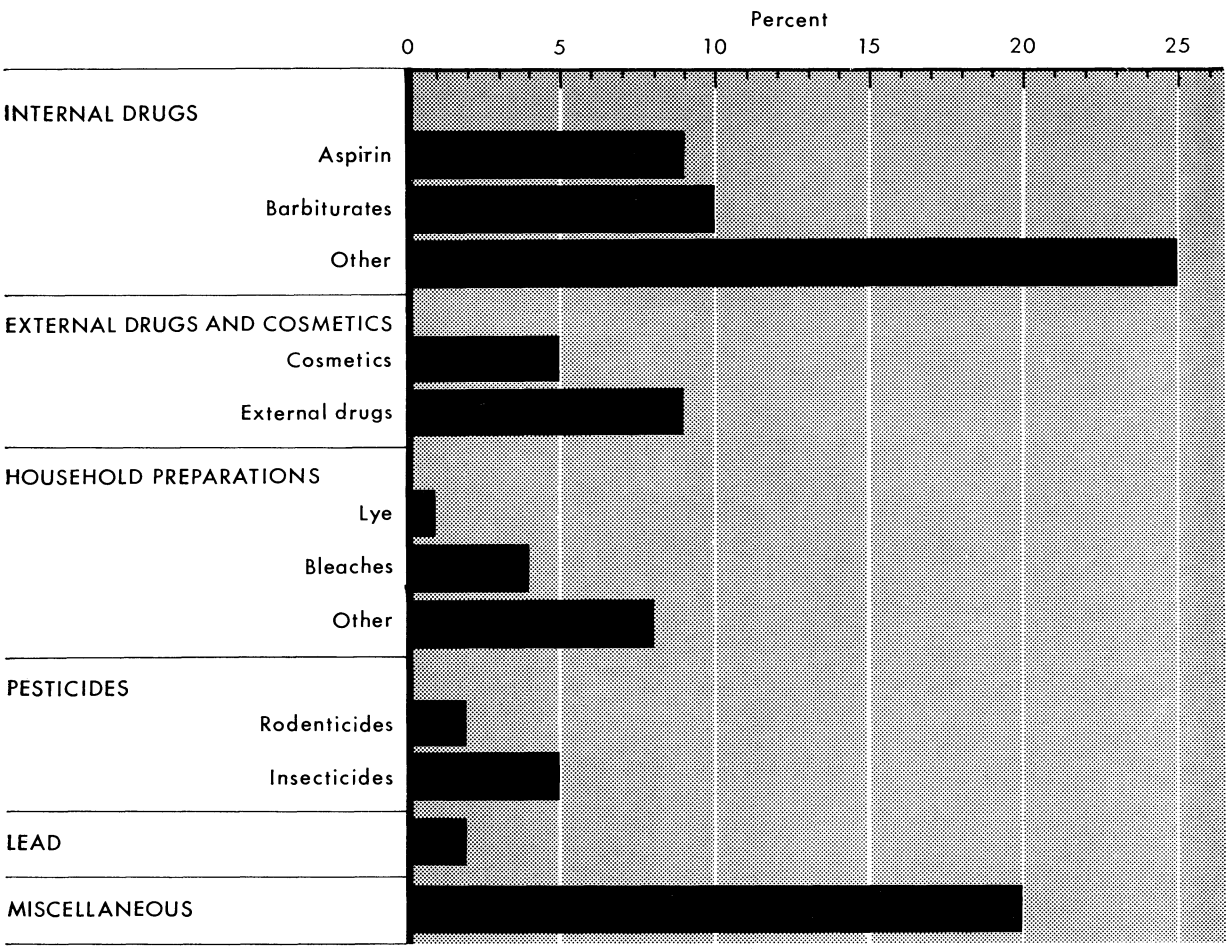
Toxic Agents

Hundreds of chemical products were the etiological agents in the reported poisonings, but for simplicity they are categorized into six major groupings—internal drugs, external drugs and cosmetics, household preparations, pesticides, lead, and miscellaneous substances (fig. 1).

Internal medications. Internal medications (medicinal drugs taken by mouth) were involved in 33 percent of reported poisonings in the age group under 20 years; aspirin, the chief offender, accounted for 13 percent of the total in this age group (fig. 2). Nearly 1,500 aspirin ingestions in persons under 20 were reported to the New York City Poison Control Center during 1963, including two fatalities. Flavored aspirin preparations were most frequently incriminated, primarily because of their frequent use for children under 5 years of age. Children under 5 are the chief victims of flavored aspirin poisoning. Many parents are still unaware of the potential toxicity of aspirin and refer to it as candy when administering it to children. Also, despite claims, there is still no safe container or closure impregnable to children.

In persons of all ages, barbiturates and aspirin together accounted for approximately 19

Figure 1. Percentage distribution by type of poisoning in 95,055 persons, New York City Poison Control Center, 1955–63



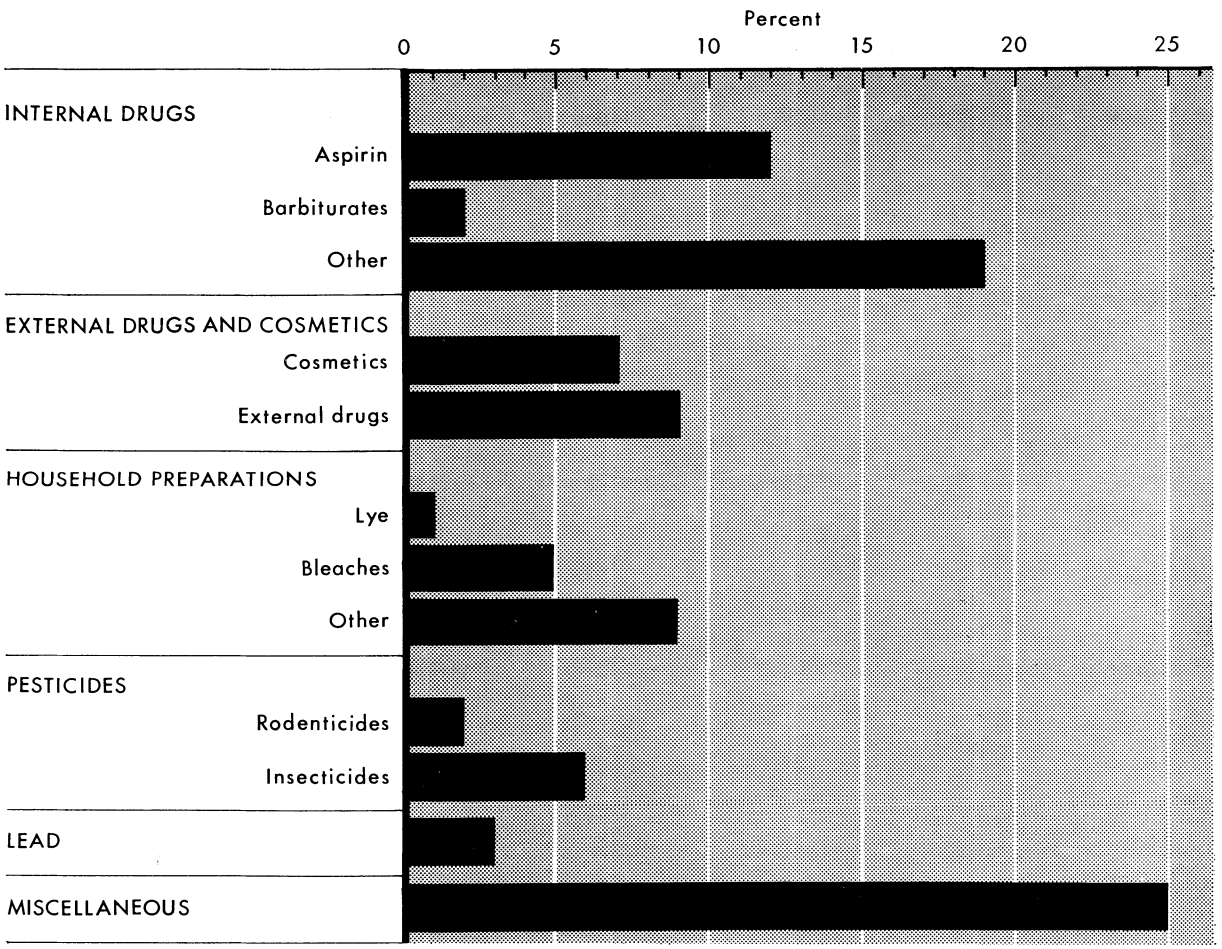
percent of all poisonings reported to the New York City center in 1955–63. Other therapeutic medications such as antihistamines, anticonvulsants, sedatives, stimulants, antidepressants, and other internal medicines accounted for another 25 percent.

Salicylates other than aspirin, particularly methyl salicylates (oil of wintergreen), poison many persons under 21. These drugs are more dangerous than aspirin; a single teaspoon may be lethal. In methyl salicylate poisonings, the case fatality rate is from 40 to 60 percent. There is no valid reason for using this highly toxic product in the home since it is of questionable therapeutic value.

Many other internal medications not generally thought of as toxic, such as sugar-coated iron preparations, can cause serious nonfatal and fatal poisonings. Iron poisoning in young children has occurred when pregnant women have carelessly left various iron preparations and vitamins of high hematinic content within easy reach of children. Between January 1963 and June 1964, about 70 cases of iron poisoning in children were reported to the New York City Poison Control Center. Products containing iron should be prescribed as a single preparation and in amounts sufficient for only 2 weeks, and the patient should be informed of the potential toxicity of such products.

In 1955 only nine accidental poisonings due to tranquilizing agents were reported to the

Figure 2. Percentage distribution by type of poisoning in 61,167 persons under 20 years of age, New York City Poison Control Center, 1955–63



NOTE: Aspirin, barbiturates, lye, bleaches, and lead accounted for more than 23 percent of reported poisonings in persons under 20 years of age.

Poisonings by age, New York City Poison Control Center, 1955–63

Type of poison	Age (completed years)							
	Under 1 year	1	2	3	4	5–9	10–14	15–19
Internal medicines	407	2, 336	6, 735	4, 801	1, 638	952	638	3, 167
Aspirin	89	574	2, 712	2, 362	766	253	174	743
Barbiturate	22	115	223	122	59	58	101	522
Other	296	1, 647	3, 800	2, 317	813	641	363	1, 902
External medicines	470	1, 503	1, 605	712	245	355	157	460
Cosmetics	229	1, 267	1, 884	554	166	110	45	68
Household preparations	379	3, 207	3, 166	1, 110	460	434	160	456
Bleaches	78	830	965	391	159	140	63	265
Lye	14	239	292	162	93	68	12	23
Other [1]	287	2, 138	1, 909	557	208	226	85	168
Solvents	92	1, 007	817	244	98	122	49	120
Turpentine	28	296	230	62	26	32	7	29
Kerosene	16	142	85	21	9	10	4	5
Other	48	569	502	161	63	80	38	86
Insecticides	260	1, 159	1, 027	425	180	188	38	145
Rodenticides	70	383	313	159	61	66	14	50
Miscellaneous	1, 032	4, 082	4, 257	1, 929	885	1, 259	418	342
Lead [2]	36	459	652	300	116	134	5	2
Other	996	3, 625	3, 605	1, 629	769	1, 125	413	340
Total	2, 939	14, 944	19, 804	9, 934	3, 733	3, 486	1, 519	4, 808
Percent	3. 1	15. 7	20. 8	10. 5	3. 9	3. 7	1. 6	5. 1

See footnotes at end of table.

New York City Poison Control Center; in 1963, however, more than 700 such incidents were reported. The growing widespread use and readier availability of tranquilizers in homes have resulted in frequent intoxications in children ingesting them. Although symptoms in such cases are often alarming, most patients recover without serious sequelae.

The increased use of fluoride preparations to prevent dental caries has caused an increase in ingestions of fluoride tablets by young children. Most of these incidents have caused only temporary mild gastritis.

External medications and cosmetics. External medications and cosmetics (drugs and preparations intended for external use) were responsible for 16 percent of all poisonings in the age group under 20 years. Liniments, particularly those containing salicylates and camphor, were often the toxic agents. Rubbing alcohol and antiseptic tincture or solutions were also frequent sources of poisonings in children. Antiseptic tinctures are particularly hazardous because of their antimicrobial content and the alcohol they usually contain. Carbon tetrachloride, which is still widely but unwisely used therapeutically as well as for cleaning, is hazardous to young children and is responsible for many fatal and serious nonfatal poisonings.

Camphorated oil is another substance of questionable therapeutic value which still causes many poisonings in children. Accidental chemical poisoning from this product often results when someone mistakes it for another product because of the container's similarity in size, shape, and color to those of other household preparations (for example, castor oil) found in the household medicine cabinet. White shoe polish is mistaken for milk of magnesia, calamine lotion for Pepto-Bismol, and boric acid powder for sodium bicarbonate.

Household preparations. Household chemicals, including bleaches, lye, disinfectants, detergents, and polishes, contributed 15 percent of all poisonings reported to the center in persons under 20 years of age. The lemon flavor of furniture polish is a chief attraction for the children who drink it. The pneumonias which result are not amenable to antibiotics and are difficult to treat.

Pesticides. Kerosene content of many pesti-

Poisonings by age, New York City Poison Control Center, 1955–63—Continued

Type of poison	Total all ages	Total under 20	Total 20 and over	Age unknown		
				Child	Adult	Not specified
Internal medicines	42, 659	20, 674	20, 098	266	720	901
Aspirin	9, 203	7, 673	1, 265	99	19	147
Barbiturate	9, 709	1, 222	8, 020	5	244	218
Other	23, 747	11, 779	10, 813	162	457	536
External medicines	8, 217	5, 507	2, 281	67	191	171
Cosmetics	4, 874	4, 323	274	68	104	105
Household preparations	12, 454	9, 372	2, 308	183	312	279
Bleaches	3, 915	2, 891	827	29	94	74
Lye	1, 248	903	268	20	26	31
Other [1]	7, 291	5, 578	1, 213	134	192	174
Solvents	3, 329	2, 549	553	41	70	116
Turpentine	835	710	91	7	7	20
Kerosene	329	292	27	3	1	6
Other	2, 165	1, 547	435	31	62	90
Insecticides	4, 378	3, 422	647	63	128	118
Rodenticides	1, 494	1, 116	296	14	11	57
Miscellaneous	17, 650	14, 204	1, 892	541	421	592
Lead [2]	1, 842	1, 704	29	33	2	74
Other	15, 808	12, 500	1, 863	508	419	518
Total	95, 055	61, 167	28, 349	1, 243	1, 957	2, 339
Percent	100. 0	64. 4	29. 8	1. 3	2. 0	2. 5

[1] Disinfectants, detergents, and polishes; all other household preparations are included under "Other" of the miscellaneous group.
[2] Data from the bureau of preventable diseases, New York City Department of Health.

cide solutions may be more dangerous than the insecticide itself. Use of parathion as a household insecticide by Puerto Ricans is an especially dangerous practice, which has resulted in death and serious illness. Phosphorus paste has resulted in many poisonings. There is no antidote, and its use is questionable. The Federal Government has finally prohibited thallium pesticides.

Lead. Lead poisoning is a continuing problem and represents a major category in poisoning deaths in children. The number of cases has been going up, but the number of deaths is down, probably as a result of improved case-finding techniques.

Leading agents. Despite the limitless diversity of the products incriminated in poisonings reported to the New York City center, five products—aspirin, barbiturates, lye, bleaches, and lead—accounted for more than 23 percent of the poisonings in persons under 20 years of age. Thus, if reasonable precautionary measures had been used in storing and handling of only these five items, nearly one-fourth of the poisonings in this highly susceptible age group might have been averted.

Characteristics of Victims

Age. Of poisonings reported in the period 1955–63 to the New York City center, 64.4 percent occurred in persons under 20 years of age (see table). Preschool children were the most susceptible group. The highest incidence is in the third year of life, the next highest in the second year of life, and the third highest in the fourth year of life. The type of toxic agent is closely related to the child's age and stage of growth and development (*2*).

In the age group under 1 year, the low frequency of accidental poisoning probably results from more intense parental supervision and protection at this age than is exercised with older children and from the infant's lack of self-propulsion. Poisonings at 2 and 3 years, when children are usually very mobile and avid explorers and "mouthers," often result from adults' careless handling and open storage of drugs and chemicals. At 2, 3, and 4 years children are climbers. They are frequently poi-

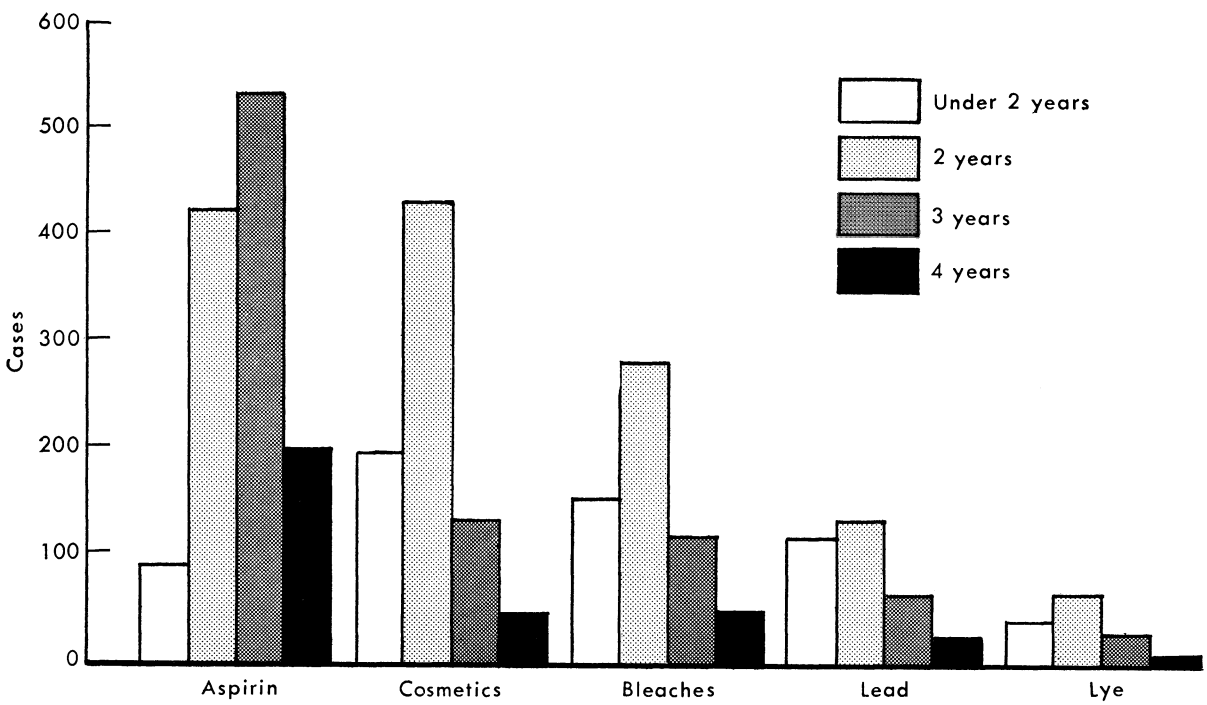
soned by potent drugs intended for the internal medication of adults. Adults leave the drugs on the tops of bureaus, television sets, and low tables and in open medicine cabinets. One-year-old creepers, unable to climb to such high places, are more likely to swallow chemical substances they find on the floor, under the kitchen sink, or under the crib. They are thus most frequently poisoned by ingesting household preparations, pesticides, solvents, bleaches, polishes, and cleaning and sanitizing agents (fig. 3).

Poisonings in children result from the interaction of an inexperienced host, an injurious agent, and an unsafe environment. As children grow older, learn from experience, and become more cautious, a striking decrease in poisonings is observed.

Development and behavior. More than 65 percent of the persons under the age of 20 involved in poisonings in our series were judged by their parents and the visiting public health nurse to be similar to the other siblings in the family. At the poison control center, the staff classified about 70 percent of the victims as average in growth, development, and intelligence and 12 percent as above average. More than 70 percent of the victims were described by staff as active and curious, and 15 percent were categorized as mischievous. Our classification, however, was judgmental and hence inconclusive and subject to error and bias.

Accident proneness. In only 8 percent of the New York City poisoning cases in children aged 16 and under was a history obtained of previous poisoning or accident to the patient. A history of prior accident to some other member of the family was elicited in 12 percent. These data are perhaps not dissimilar from those for the general population in this age group. In contrast, in an anterospective study of 100 children 1–6 years of age who were involved in accidental ingestions, Wehrle (*3*) found that 28 percent experienced one or more additional episodes of poisoning within the next year. He also found other behavioral differences between the repeater group and the control group. Another recent study (*4*) indicates that repetitive poisoning in children is not related to accident proneness, pica, environmental hazards, or lack of parental supervision but results from purposeful behavior by the

Figure 3. Distribution of some leading causes of poisoning in children under 5 years of age, New York City Poison Control Center, 1963



child. This author concluded that correlated with the behavior of the repeater are "hyperactivity, negativism and other behavioral problems of the child, a limited parent-child relationship, marital tension and a tense and distant family atmosphere."

Although we did not do any comparative study with a nonaccident group or a nonrepeater group, our investigations on persons under 21 involved in poisonings and other accidents do not identify an accident-prone child or accident-prone family but rather accident-prone situations—the interactions of an inexperienced host with a potential toxic agent in an unsafe environment. We believe that an accident is no accident but can be predicted in a certain constellation (*5–7*). It will occur with greater frequency when there is a deviation or disturbance from the ordinary routine, such as during moving, housecleaning, painting, a holiday rush, preparing for a vacation, and during periods of stress and tension, such as an illness or death in the family or other periods of family disorganization. When a child is visiting friends or relatives, the risk of accidental poisoning is increased. He finds himself in an unknown environment which he wishes to explore, and he is often allowed to do so on his own.

Sex and ethnic group. The incidence of poisoning is slightly higher in the male; male poisonings comprise 55 percent of the total. The higher incidence reported in nonwhites undoubtedly results from prevailing socioeconomic conditions—poor housing, overcrowding, inadequate home storage space, undernutrition, and a lack of safety information. It is not genetically determined.

Family status and residence. The educational and socioeconomic levels of the families in our series were evaluated by visiting nurses as medium in 57 percent of the reported poisoning incidents and as low in 25 percent of them. A much higher incidence of accidental poisonings was reported in children from low socioeconomic districts.

In more than 22 percent of the poisonings involving young children, the families told the interviewing public health nurse that they were unaware that the incriminating agent was hazardous. Sixty percent of the families, however, stated that they knew the substances were dangerous but did not keep them out of reach of children.

Circumstances and Place

The highest frequency of poisonings in our series, 45 percent of those in persons under 21, occurred between 12 noon and 6 p.m.; 35 percent occurred between 6 a.m. and 12 noon. Between noon and 6 p.m., a child is likely to be engaged in play and exploring his environment; he also may become overly tired in the afternoon. We noticed no distinctive seasonal variation in our cases except those involving lead, aspirin, naphthalene (we have no explanation for this), and poisonings from Christmas tree ornaments.

While at the time of the poisoning the child was nominally under adult supervision, in more than 70 percent of our cases the accident occurred with lightning rapidity when the adult was momentarily distracted to answer the telephone, open the door, and the like. The effect of disruptions of the household routine for longer periods and for more serious reasons has already been discussed.

In our series of poisonings, the kitchen was the most dangerous place, accounting for more than 40 percent of poisonings in persons under 20 years of age. The bedroom accounted for 27 percent, the bathroom for 15 percent, and the living room for 10 percent. Many other poisonings occurred in and around the house, in the yard, garage, foyer, and cellar (*8*).

	Percent of total poisonings	
Location of toxic agent	*New York City series*	*National data*
In the open	80. 1	72. 4
Furniture top	36. 6	32. 4
Floor	16. 1	12. 8
Open shelf	11. 5	10. 1
Window ledge	3. 4	1. 7
Sink	7. 6	. 8
Other	4. 9	14. 6
Not in the open	19. 9	27. 6
Cabinet or closet	11. 3	23. 6

There is general agreement that the kitchen is the most hazardous area in which to leave children unsupervised. The National Clearing-

house for Poison Control Centers lists it as the room of greatest risk. The clearinghouse, however, lists the bathroom as second and the bedroom as third. The disparity probably arises because our series includes persons up to 20 years of age, while the national figures are limited to children under 5 (*9*, *10*).

In our studies, we found that adults had placed the toxic substance where the victim could easily reach it in more than 80 percent of the poisonings reported in persons under 20 years of age.

The drugs and household preparations most easily available cause the greatest number of poisonings. Usually these are the products in current use. One striking example of the potent effect of availability is the frequency of chemical poisonings in the homes of physicians, dentists, pharmacists, and drug salesmen. In these homes there is often an abundance of drug samples, and these are frequently improperly stored.

Unsafe Practices

Unlabeled or mislabeled containers. Removing a chemical substance or drug from its original container and transferring it to a household utensil increases the risk of an accidental poisoning, particularly if the utensil is not promptly labeled. In nearly 37 percent of the poisonings reported to the center, the injurious agent was not in its original container when the poisonings occurred. Medicines were most commonly in their original containers; bleaches, insecticides, rodenticides, solvents, sanitizing agents, ammonia, and petroleum distillates, however, were not, in more than 55 percent of the reported cases. Carbon tetrachloride, kerosene, oil of wintergreen, benzene, turpentine, ammonia, furniture polish, rodenticides, and insecticides were frequently stored in unlabeled drinking glasses, saucers, mayonnaise jars, soda bottles, milk bottles, fruit jars, and coffee cans and were frequently left on the floor. Children often mistook the medications implicated in poisonings for candy and the household products for food, water, or soft drinks.

A hazardous practice in certain ethnic groups is to buy gallon quantities of a household product and redistribute it in unlabeled household containers to other families in the same tenement house or to friends and relatives. Placement of containers of similar size, shape, and color and with similar labels in a cabinet may lead to a person's mistaking one medicine for another and result in errors in medication—an occurrence not uncommon in hospitals. It is perhaps surprising that more incidents of this kind are not reported from hospitals, since in pediatric wards and in dressing rooms, many medicines are often stored on bedside tables and in cabinets within easy reach of children.

Many hospitals dispense drugs in small cardboard boxes without any data on the containers to identify the hospital, type of medication, dose intervals, or cautions as to use. In case of poisoning, this practice makes identification of the etiological agent difficult and needlessly delays prompt and appropriate therapy.

Drug shipments by mail. Sending potent drugs and chemicals by mail may prove hazardous. An 18-month-old girl died recently from strychnine pills sent by mail. The prescription, intended for a neighbor, was picked up by the girl's mother at a shared rural mailbox and placed on a dresser pending the neighbor's return. The mother later found the girl and her 3-year-old son playing with the pills on the floor. Both children were rushed to the hospital, but the girl died. At times mailmen leave packages containing drugs too large for the mailbox on the doorstep, where they may easily be picked up by children. Packages that are tamper proof against children should be used for mailing drugs and chemicals (*11*).

Deteriorated or contaminated drugs. Use of deteriorated or contaminated drugs or those whose safety has not yet been established contributes to the accidental poisoning toll. Discarding unused or deteriorated drugs in trash cans can lead to poisoning. Discarded drugs should be removed from their containers and emptied down the drain or the incinerator. Contaminated drugs are potentially dangerous. A hospitalized woman died recently in New York City after she was administered an oxidized solution of the sedative, paraldehyde, which had degraded to acetic acid. Accidental intoxications from drug contamination have also occurred. Seven children on a tuberculosis ward who were given isonicotinic acid hydra-

zide tablets contaminated with diethylstilbestrol developed signs of precocious puberty (*12*). No drug should be used if it is discolored, outdated, or appears deteriorated in any way.

Abuse or misuse of drugs. Many severe poisonings have occurred in the past few years from the abuse of potent drugs by teenagers in search of excitement. Notable examples are the wide use of hallucinogenic drugs, indiscriminate use of "pep pills," and the practice of glue-sniffing.

There is an erroneous belief that boric acid is harmless when applied to the intact skin. During an 18-month period, however, 150 accidental boric acid poisonings were reported to the New York City Poison Control Center. The majority were of moderate severity, and there were no fatalities.

Dangerous playthings. Floating plastic nursery toys designed as playthings in the bath present a potential aspiration hazard if they are filled with mineral oil. If cracks develop in them after use, the oil seeps out. Vegetable oil would provide adequate buoyancy.

A New York City child died recently after ingesting a firecracker which resembled a candy but contained a large quantity of arsenic.

New York City Poison Control Center

The New York City Poison Control Center was the first to be established as an integral part of a health department. Most of the more than 500 other poison control centers throughout the country are still hospital based. The largest single unit of its kind in the world, the New York City center has an operating budget of nearly a quarter of a million dollars. It is a regional center but has also provided assistance to about 150 localities in upstate New York and to approximately 75 localities in New Jersey. The facility answers many inquiries also from various other U.S. cities and States and from Canada and other foreign lands. The center does not limit its services to any age group. It operates 365 days a year around the clock, providing information to all inquirers, both medical practitioners and the general public.

Poison control officers in the 174 hospitals in New York City with emergency services are responsible for reporting all cases of poisoning to the center as soon as they occur and, also, for subsequently reporting a patient's discharge or completion of treatment. Such reports include a detailed account of mode of occurrence of the poisoning, the symptoms, treatment, and outcome.

Extensive files are kept at the center on all poisoning events. A complete active register is maintained on each toxic agent, hospital, and patient. The center has an up-to-date comprehensive library for staff reference, providing information on recent advances in pharmacology and toxicology and on new products and the appropriate treatment for poisonings caused by them. Nearly all inquiries are answered within minutes. If information is unavailable when a call is received, every effort is made to obtain the information for the caller. On selected cases of poisonings, the center carries on epidemiologic investigations as to type of poison, age, sex, and ethnic group of the victim; locale, season, and time of day; symptoms, treatment, and outcome; preventability and the human factors involved. The staff try to discover how, where, when, to whom, and why a particular poisoning occurred.

Based on the facts obtained, the staff of the center formulate appropriate therapy and sound preventive measures for application in labeling, standardization of dosage, and packaging and as precautionary practices for the home and industry. The center makes such information freely available to other health agencies and activities. While management and treatment of poisonings—initially the primary reasons for the center—are still an important responsibility, the center now focuses on prevention. It aims to accomplish this in part by directing reliable, factual information to all levels of the population. The center carries on an active and continuous education program for hospital staffs and practicing physicians, providing periodic talks at regularly scheduled medical meetings, issuing technical notices and pamphlets, publishing case reports in medical journals, and setting up exhibits. It also carries on an intensive program of education in the medical schools and in schools of nursing and pharmacy. Students of these schools are

given the opportunity to observe the center in action. To inform the public, an intensive educational program uses all mass communications media.

The center performs an important service by reassuring and allaying anxieties of parents, physicians, pharmacists, and hospital staffs on minor nontoxic incidents. Thus unnecessary overtreatment is avoided.

The staff of the center have been deeply concerned about the effects of massive overdosage of certain drugs. They have made intense efforts to get physicians to report side reactions and pioneered in getting pharmaceutical companies and drug manufacturers to include in their advertising brochures information on side reactions, contraindications, maximum therapeutic dosage, and symptoms and treatment of overdosage.

The center has become a valuable casefinding device for industrial hygiene incidents since its staff immediately report to the industrial hygiene division of the health department incidents involving any products which may be used in industry.

From the year of its establishment, the New York City Poison Control Center has advocated that physicians promptly report to the health department all adverse reactions resulting from drugs, since drugs are truly "poisonings" (*10*). In 1955 the center's technical advisory committee, composed of representatives from the fields of preventive medicine, internal medicine, toxicology, pharmacology, chemistry, engineering, and industry, approved recommendations that one of the important functions of a poison control center is "the accumulation and prompt dissemination of new knowledge and information relating to adverse reactions, toxicity of new products, and iatrogenic accidents" and "that any previously unknown hazard should be immediately reported by physicians, so that it may be immediately publicized and the medical profession and the lay public duly alerted." This action preceded the thalidomide disaster by 5 years.

The center has supplied information on blood dyscrasias arising from drugs to the American Medical Association's committee on blood dyscrasias.

Poison Prevention

It is not known precisely how many lives have been saved and how much disability has been prevented because the poison control centers exist. It may be presumed, however, that their accomplishments have not been insignificant. Despite the valuable services provided by the network of poison control centers throughout the country, however, there has been no significant reduction in overall morbidity and mortality from accidental poisonings since the inceptions of the centers, as shown by the following data from National Center for Health Statistics, Public Health Service.

Year	*Deaths*	*Rate per 100,000*
1954	438	2.4
1955	401	2.2
1956	447	2.4
1957	438	2.3
1958	469	2.4
1959	503	2.5
1960	503	2.5
1961	484	2.3
1962	472	2.3
1963	515	2.4

The U.S. mortality rate for poisonings in children under 5 years of age in 1963 was exactly the same as in 1954 when the poison control movement was initiated. For persons of all ages, poisonings from solids and liquids showed an increase in mortality from 0.8 per 100,000 in 1954 to 1.1 in 1963, a net increase of 38 percent (*13*). These figures emphasize the need for further exploration and refocusing of our efforts and approaches. The ultimate goal must be prevention.

Either the technical director of the New York City Poison Control Center, the interviewing public health nurse, or I carefully scrutinized all accidental poisoning reports in our series. Exclusive of intentional poisonings, more than 95 percent of the reported incidents could have been prevented if commonsense precautions had been observed in handling, storing, and using the potentially toxic products incriminated in the incidents.

A contribution to drug safety would be for physicians to prescribe drugs in the lowest effective therapeutic dosages and, with some exceptions, in amounts sufficient for no more

than a week's treatment. Drug manufacturers contribute to safety by mentioning side reactions, contraindications, precautionary measures for handling and storage, and the treatment of overdosage along with advertising a drug's effectiveness. Manufacturers of household products and pharmaceuticals could help prevent accidental poisonings by carrying on a vigorous safety campaign along with sales promotion. Continuous efforts to substitute nontoxic ingredients for potentially hazardous ones and the design and use of truly "safe" containers would also contribute greatly to accident prevention.

It will be difficult to control the human factors in accidental poisonings until basic collaborative research provides additional guidelines. Yet many poisonings can be averted if available knowledge is more widely applied. The agent and the environment can be manipulated and made safer. We know that accidental poisonings do not just happen. Since they are caused by interaction of a susceptible host, a toxic agent, and an unsafe environment, they are theoretically largely preventable.

Prevention of accidental poisonings, however, will require the participation of the entire team concerned with the health and safety of the public. The team includes the physician, pharmacist, public health worker, public health nurse, engineer, social scientist, pharmacologist, toxicologist, chemist, environmental sanitarian, law enforcement officer, industrialist, housing authority, nurse, hospital staff worker, health educator, psychiatrist, psychologist, teacher, and statistician.

REFERENCES

(1) Jacobziner, H., and Raybin, H. W.: A new approach to the control of chemical poisoning. New York J Med 57: 209–215, Jan. 15, 1957.

(2) Jacobziner, H.: Accidental chemical poisonings in children. JAMA 162: 454–459, Sept. 29, 1956.

(3) Wehrle, P. F., et al.: Epidemiology of accidental poisoning in an urban population, pt. 3. The repeater problem. Pediatrics 27: 614–620, April 1961.

(4) Solel, R., and Margolis, J. A.: Repetitive poisoning in children; a psychosocial study. Pediatrics 35: 641–651, April 1965.

(5) Jacobziner, H., and Rich, H.: Home safety and accident prevention in a child health conference. Amer J Public Health 44: 83–93 (1954).

(6) Jacobziner, H.: Childhood accidents and their prevention. Amer J Dis Child 93: 647–665 (1957).

(7) Jacobziner, H., Rich, H., and Merchant, R.: A study of nonfatal accidents in children under supervision in child health stations of New York City, Department of Health (1952–1959). Pediatrics 26: 415–431, September 1960.

(8) Jacobziner, H., and Raybin, H. W.: Accidental poisonings in childhood and their prevention. J Pediat 49: 592–606, November 1956.

(9) Cann, H. M., Iskrant, A. P., and Neyman, D. S.: Epidemiologic aspects of poisoning accidents. Amer J Public Health 50: 1914–1924, December 1960.

(10) Jacobziner, H.: Causation, prevention and control of accidental poisonings. JAMA 171: 1767–1777, Nov. 28, 1959.

(11) U.S. Department of Health, Education, and Welfare: Food and Drug Administration Bulletin. Dec. 5, 1962.

(12) Weber, W., et al.: Drug contamination with diethylstilbestrol. New Eng J Med 268: 411–414, Feb. 21, 1963.

(13) National Safety Council: Accident facts. Chicago, 1965.